

Claims:

1. A thermally developable material comprising a support and having therein at least one thermally developable imaging layer comprising a hydrophilic polymer binder or a water-dispersible polymer latex binder and in reactive association:
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- a. a non-photosensitive source of reducible silver ions, and
 - b. a reducing agent for said reducible silver ions,
- wherein said non-photosensitive source of reducible silver ions predominantly comprises rod-shaped particles of a silver salt of a nitrogen-containing heterocyclic compound containing an imino group, said rod-shaped particles having an average aspect ratio of at least 3:1 and a width index for particle diameter of 1.25 or less.
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2. The material of claim 1 wherein said rod-shaped particles have a diameter less than or equal to 0.1 μm .
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3. The material of claim 1 wherein said rod-like particles of said silver salt of a nitrogen-containing heterocyclic compound containing an imino group represent at least 70% by number of all particles of organic silver salts.
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4. The material of claim 1 wherein said rod-like particles have a length that is less than 1 μm .
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5. The material of claim 4 wherein said rod-like particles have a length of from about 0.1 to about 0.5 μm .
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6. The material of claim 1 wherein said rod-like particles have an aspect ratio of from about 3 to about 10.

7. The material of claim 6 wherein said rod-like particles have an aspect ratio of from about 4 to about 7.5.

8. The material of claim 1 wherein said rod-like particles have a width index for particle diameter of from about 1.1 to about 1.2.

9. The material of claim 1 wherein rod-like particles are composed of silver salt of benzotriazole or a derivative thereof.

10. The material of claim 1 further comprising a photosensitive silver halide.

11. A black-and-white photothermographic material comprising a support and having therein at least one thermally developable imaging layer comprising a hydrophilic polymer binder or a water-dispersible polymer latex binder and in reactive association:

- a. a photosensitive silver halide,
- b. a non-photosensitive source of reducible silver ions, and
- c. a reducing agent for said reducible silver ions,

wherein said non-photosensitive source of reducible silver ions comprises particles of one or more organic silver salts provided that at least 70% by number of said particles are rod-shaped particles of a silver salt of a nitrogen-containing heterocyclic compound containing an imino group, said rod-shaped particles having an average aspect ratio of at least 3:1 and a width index for particle diameter of 1.25 or less.

12. The material of claim 11 wherein said hydrophilic polymer binder is gelatin, a gelatin derivative, or a cellulosic material.

13. The material of claim 11 wherein said reducing agent is an ascorbic acid, hindered phenol, or mixture thereof, and said rod-like particles of a

silver salt of a nitrogen-containing heterocyclic compound are rod-like particles of a silver salt of benzotriazole or a derivative thereof.

14. The material of claim 11 wherein said rod-like particles
5 have a length of from about 0.1 to about 0.5 μm , an aspect ratio of from about 3 to about 10, and a width index for particle diameter of from about 1.1 to about 1.2.

15 15. The material of claim 11 comprising one or more of the same or different thermally developable imaging layers on both sides of said support.

16. The material of claim 11 wherein said water-dispersible binder is a water-dispersible polymer latex.

15 17. A black-and-white photothermographic material comprising a support having on a frontside thereof,

a) one or more frontside thermally developable imaging layers comprising a hydrophilic polymer binder or a water-dispersible polymer latex binder, and in reactive association, a photosensitive silver bromide, silver
20 iodobromide, or a mixture thereof,

b) a non-photosensitive source of reducible silver ions that includes a silver salt of benzotriazole or a derivative thereof, and

c) a reducing agent for said non-photosensitive source reducible silver ions,

25 said material comprising on the backside of said support, one or more backside thermally developable imaging layers having the same or different composition as said frontside thermally developable imaging layers, and

d) optionally, an outermost protective layer disposed over said one or more thermally developable imaging layers on either or both sides of said support,
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said silver salt of benzotriazole or a derivative thereof comprising rod-shaped particles that have a length of from about 0.1 to about 0.5 μm , a diameter less than 0.1 μm , an aspect ratio of from about 4 to about 7.5, and a width index for particle diameter of from about 1.1 to about 1.2.

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18. The material of claim 17 having one or more of the same thermally developable imaging layers on both sides of said support, and said material is sensitive to electromagnetic radiation of from about 100 to about 700 nm.

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19. A method of forming a visible image comprising:

A) imagewise exposing the photothermographic material of claim 11 to form a latent image,

15 B) simultaneously or sequentially, heating said exposed photothermographic material to develop said latent image into a visible image.

20. The method of claim 19 wherein said thermally developable material comprises a transparent support, and said image-forming method further comprises:

20 C) positioning said exposed and thermally-developed material with the visible image therein between a source of imaging radiation and an imageable material that is sensitive to said imaging radiation, and

25 D) exposing said imageable material to said imaging radiation through the visible image in said exposed and thermally-developed material to provide an image in said imageable material.

21. The method of claim 19 wherein said imagewise exposing is carried out using visible or X-radiation.

22. The method of claim 19 wherein said thermally developable material is arranged in association with one or more phosphor intensifying screens during imaging.

5 23. The method of claim 19 wherein said exposed photo-thermographic material is used for medical diagnosis.

24. A method of forming a visible image comprising:

- 10 A) imagewise exposing the photothermographic material of claim 17 to form a latent image,
B) simultaneously or sequentially, heating said exposed photothermographic material to develop said latent image into a visible image.

15 25. An imaging assembly comprising the photothermographic material of claim 11 that is arranged in association with one or more phosphor intensifying screens.

26. A method of making particles of a silver salt of a nitrogen-containing heterocyclic compound containing an imino group, comprising:

- 20 A) preparing aqueous solution A of a nitrogen-containing heterocyclic compound containing an imino group,
B) preparing aqueous solution B of silver nitrate, and
C) simultaneously adding said aqueous solutions A and B to a reaction vessel containing an aqueous dispersion of a hydrophilic polymer binder or a
25 water-dispersible polymer latex binder that has a pH of from about 7.5 to about 10,

said simultaneous addition of said aqueous solutions A and B being carried out at constant flow rates A_1 and B_1 , respectively, for up to 240 minutes, while maintaining a constant temperature of from about 30 to about 75°C, a
30 constant pH, and a constant v_{Ag} equal to or greater than -50 mV in said reaction vessel,

thereby preparing in said reaction vessel an organic silver salt dispersion of said hydrophilic polymer binder or said water-dispersible polymer latex binder and rod-shaped particles of a silver salt of said nitrogen-containing heterocyclic compound containing an imino group, said particles having an average aspect ratio of at least 3:1 and a width index for particle diameter of 1.25 or less, and said hydrophilic polymer binder or said water-dispersible polymer latex binder being present in said organic silver salt dispersion in an amount of from about 2 to about 10 weight %.

10 27. The method of claim 26 further comprising, after step C, the step of:

 D) increasing the flow rate of the addition of solution B to said reaction vessel to B₂ for up to 60 minutes while maintaining constant temperature, pH, and vAg in said reaction vessel, wherein the ratio of said flow rate B₂ to said flow rate B₁ is from about 1.4:1 to about 1.8:1.

 28. The method of claim 27 further comprising, after step D, the step of:

 E) increasing the flow rate of the addition of solution B to said reaction vessel to B₃ for up to 60 minutes while maintaining constant temperature, pH and vAg in said reaction vessel, wherein the ratio of said flow rate B₃ to said flow rate B₂ is from about 1.8:1 to about 2.2:1.

 29. The method of claim 26 wherein said nitrogen-containing heterocyclic compound containing an imino group is benzotriazole or a derivative thereof.

 30. The method of claim 26 wherein the pH in said reaction vessel is maintained at from about 8 to about 9.5.

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31. The method of claim 26 wherein said v_{Ag} is maintained in said reaction vessel at equal to or greater than 0 mV.

32. The method of claim 26 wherein the ratio of flow rate A_1 to total Ag moles precipitated is from about 0.004 to about 0.04 mol/min/mol Ag of imino group-containing compound per minute and the ratio of flow rate B_1 to total Ag moles precipitated is from about 0.004 to about 0.04 mol Ag/min/mol Ag.

33. The method of claim 26 wherein said hydrophilic polymer binder or said water-dispersible binder is present in said organic silver salt dispersion in an amount of from about 2 to about 10 weight %.

34. The method of claim 26 wherein said reaction vessel temperature is maintained at from about 35 to about 55°C.

35. The method of claim 26 wherein said rod-shaped silver salt particles have a width index for particle diameter of from about 1.1 to about 1.2 and an aspect ratio of from about 3 to about 10.

36. The method of claim 35 wherein said rod-shaped silver salt particles have an aspect ratio of from about 4:1 to about 7.5:1.

37. A method of making a silver salt of silver benzotriazole, comprising:

- A) preparing aqueous solution A of benzotriazole,
- B) preparing aqueous solution B of silver nitrate, and
- C) simultaneously adding said aqueous solutions A and B to a reaction vessel containing an aqueous dispersion of gelatin or a gelatin derivative that has a pH of from about 8 to about 9.5,

said simultaneous addition of said aqueous solutions A and B being carried out at constant flow rates A_1 and B_1 , respectively, for up to 60 minutes,

while maintaining a constant temperature of from about 40 to about 60°C, a constant pH, and a constant vAg that is greater than 0 mV in said reaction vessel,

D) increasing the flow rate of the addition of said solution B to said reaction vessel to B₂ for up to 60 minutes while maintaining constant temperature, pH, and vAg in said reaction vessel, wherein the ratio of said flow rate B₂ to said flow rate B₁ is from about 1.4:1 to about 1.8:1, and

E) subsequently increasing the flow rate of the addition of said solution B to said reaction vessel to B₃ for up to 60 minutes while maintaining constant temperature, pH and vAg in said reaction vessel, wherein the ratio of said flow rate B₃ to said flow rate B₂ is from about 1.8:1 to about 2.2:1,

thereby preparing in said reaction vessel an organic silver salt dispersion of said gelatin or gelatin derivative and rod-shaped particles of silver benzotriazole having a width index for particle diameter of from about 1.1 to about 1.2, an average aspect ratio of from about 4:1 to about 7.5:1, and a diameter of less than or equal to 0.07 µm, and said gelatin or gelatin derivative being present in said organic silver salt dispersion in an amount of from about 2 to about 10 weight %.

38. An organic silver salt dispersion of a hydrophilic polymer binder or a water-dispersible polymer latex binder and rod-shaped particles of a non-photosensitive silver salt of a nitrogen-containing heterocyclic compound containing an imino group, said particles having an average aspect ratio of at least 3:1 and a width index for particle diameter of 1.25 or less, and said hydrophilic polymer binder or said water-dispersible polymer latex binder being present in said organic silver salt dispersion in an amount of from about 2 to about 10 weight %.

39. A non-photosensitive silver salt of a nitrogen-containing heterocyclic compound containing an imino group, said silver salt being in the form of rod-shaped particles having an average aspect ratio of at least 3:1, a width index for particle diameter of 1.25 or less, a diameter less than or equal to 0.1 µm, and a length that is less than 1 µm.